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was rendered very faint, as if all the titanium vapor were turned into the oxide, and this gave the band spectrum alone. No decided change in temperature was evident when air was used in the tube.

It may be noted that this use of the furnace produces what may be regarded as a very hot flame spectrum, since the metallic vapor in the tube is raised to a high temperature and the oxygen is then supplied for the flame effects.

Experiments with the furnace in vaporizing magnesium and calcium in an atmosphere of hydrogen confirms the arc results as to the effect of hydrogen in bringing out the bands ascribed to the hydrides of these elements. Both sets of bands can be produced faintly with the furnace pumped out, but the spectrum of the "tube-arc" has shown that considerable hydrogen is present under such conditions, probably occluded by the graphite tube. The use of hydrogen in the furnace chamber at different pressures and temperatures gave rather variable results until the method was adopted of passing a stream of hydrogen thru the furnace tube during the exposure, the pressure in the chamber being maintained at from 10 to 20 cm. of mercury. The bands were then obtained moderately strong without, however, any perceptible weakening of the line spectrum. The best defined bands in these bands are at $\lambda\lambda$ 4845, 5211, 5261 for magnesium and $\lambda\lambda$ 6382, 6389 for calcium. A temperature not higher than 2200° C. seemed to be most favorable for them. At 2500° the bands were weaker and were liable to appear in absorption, as if they were given by the cooler vapor near the end of the tube.

These results indicate that the strengthening of the titanium, magnesium, and calcium bands by the presence of oxygen or hydrogen, observed in the arc experiments, does not depend on an alteration of the arc discharge by the surrounding gas, and point to the formation of a compound at moderate temperature in each case.

ARTHUR S. KING.

THE MAGNESIUM LINE λ 4571 IN THE ELECTRIC FURNACE.

In some experiments made in 1904 with a furnace consisting of a carbon tube tested by an arc playing on the outside, I observed a

very high relative intensity of the Mg line λ 4571.275, one of the weaker arc lines, when magnesium was vaporized inside the tube. A recent study of the magnesium spectrum in the tube resistance furnace at different temperatures has confirmed this observation and shows a striking contrast between this line and neighboring lines of magnesium. At 1950° C., λ 4571 is of nearly the same intensity as λ 5184, the strongest member of the *b* group, while the strong arc lines $\lambda\lambda$ 4352 and 4703 have not appeared. At temperatures above 2200° , while the arc lines are gradually developing λ 4571 is liable to appear in absorption, its tendency to reverse being comparable with that of the calcium line λ 4227, λ 4571 remains narrow, however, and when in absorption does not show distinct emission wings in the photographs thus far made, indicating that the line may not be given by the hot vapor in the middle of the tube. At any rate, a decided strength for λ 4571 seems a clear indication of a low temperature condition.

ARTHUR S. KING.

THE SPECTRUM OF NOVA GEMINORUM NO. 2, FEBRUARY, 1916.

A photograph of the spectrum of Nova *Geminorum* No. 2 taken on the nights of February 12th and 13th with a total exposure of nine hours shows that it has remained essentially unchanged during the past year. The spectrum is of the definite Wolf-Rayet type with bright hydrogen lines and an exceedingly prominent bright band at λ 4686. Several other Wolf-Rayet bands are present. The continuous spectrum is very strong.

WALTER S. ADAMS.

FRANCIS G. PEASE.

TWO SPECTROSCOPIC BINARIES.

	Mag.	Spectrum	R. A. 1915	Dec. 1915	Range in Velocity, km Composite
Boss 4138....	5.7	F8p	16h 11m.5	+34° 5'	-86 to +10
5996....	5.9	A2	23 14 .1	+41 19	

The first of these stars is the brighter component of the well-known double star σ *Coronae*. On two of the spectrograms the

spectra of both components appear and are very similar in character. A relative displacement between the components of nearly 140^{km} is indicated by one of these photographs.

WALTER S. ADAMS.

AN INTERESTING CASE OF TWO STARS OF COMMON MOTION.

In a previous number of this *Journal* reference was made to the extraordinary radial velocity of the large proper motion star A. Oe. 14320. A second star with the same proper motion is distant from it $5'$ in declination. Two observations of the spectrum of this second star have now been obtained. The results for the pair are as follows:

Mag.	Spectrum	R. A. 1915	Dec. 1915	μ	V, km
A. Oe. 14320	9.2 G4	15h 5m.5	$-15^{\circ} 57'.5$	$3''.76$	+295
A. Oe. 14318	9.6 G5	15h 5m.5	$-16^{\circ} 2'.5$	$3''.76$	+307

The photographs were taken with low dispersion and the accuracy of the determinations is relatively low. The radial velocities of the two stars may, therefore, be considered as equal. The absolute parallax of the stars is $+0''.035$ according to a determination by Russell. Hence their distance from one another is about 8600 times the radius of the Earth's orbit, or about one-thirtieth of the distance to *α Centauri*. We have, therefore, the interesting result that two stars separated from each other by an interval of the order of stellar distances are moving in precisely the same direction at a rate of about 580^{km} per second.

WALTER S. ADAMS.

THE COLORS OF FIFTEEN VARIABLES IN M 3.

We know from Bailey's work that in length of period and nature of light variation the variable stars in the globular cluster Messier 3 are closely similar to the short period Cepheids found outside the clusters. From recent measures of photographic and photovisual magnitudes it now appears that the spectra of these stars are also